ZIYI ZHOU

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INTERESTS

My current research interests center around **optimization-based** planning, control, and estimation for **contact-rich** manipulation and legged locomotion, especially in: 1) **Distributed trajectory optimization** and **model predictive control**; 2) Safe **contact planning** in cluttered environments; 3) **Reactive task and motion planning** for single- and multi-robot system.

EDUCATION

Georgia Institute of Technology *Aug. 2020 - May. 2025 (expected)*
Doctor of Philosophy, Electrical and Computer Engineering Atlanta, GA
Advisor: Ye Zhao
Committee Members: Seth Hutchinson, Patrick Wensing, Patricio Vela, Samuel Coogan

Georgia Institute of Technology *Aug. 2018 - May. 2020*
Master of Science, Electrical and Computer Engineering Atlanta, GA
Advisor: Ye Zhao

Northeastern University *Oct. 2014 - Jun. 2018*
Bachelor of Engineering, Automation Shenyang, CHINA

WORK AND RESEARCH EXPERIENCE

Georgia Institute of Technology *Jan. 2019 - Present*
Graduate Research Assistant, Advisor: Prof. Ye Zhao

· Distributed Trajectory Optimization for Legged Locomotion

- Designed distributed and computationally efficient framework legged locomotion to achieve consensus between centroidal and whole-body dynamics models.
- Achieved reliable jumping motions on Mini-Cheetah.

· Simultaneous Trajectory and Force Optimization for Soft Manipulation

- Developed framework for simultaneous trajectory optimization and force control considering interaction between manipulator and soft environments.
- Implemented an online model predictive controller and verified our algorithm on KUKA Robotic Arm.

· Task and Motion Planning for Contact-Rich Manipulation

- Established a task and motion planning framework for long-horizon manipulation.
- Combined multi-level graph search with trajectory optimization to generate a sequence of non-prehensile motions such as pick and throw.

Mitsubishi Electric Research Laboratories (MERL) *Jan. 2024 - May.2024*
Research Intern, Advisor: Dr. Karl Berntorp

· Contact Detection and Force Estimation for Dynamic Quadrupedal Locomotion

- Proposed a simultaneous contact detection and force estimation approach

- Designed reflex motion during collision for robust locomotion

SkyMul *Sep. 2022 - Dec. 2023*
Lead Motion Planning and Control Engineer & Student Researcher

· Safe Gait Planning and Motion Control for Quadruped Robots on Construction Sites

- Developed reactive and safe gait planning framework combining mixed-integer convex programming and temporal logic-based method.
- Worked on a nonlinear model predictive controller to allow traversing cluttered environments.
- Achieved robust loco-manipulation performance for rebar tying tasks; showcased the result on World of Concrete 2023.

UBTECH Robotics North America *Jun. 2021 - Aug. 2021*
Research Intern, Advisor: Dr. Dejun Guo

· Heterogeneous Multi-Robot Task Allocation and Planning

- Devised simultaneous task allocation and planning algorithm for a robot team including quadrupeds and wheeled robots in a hospital scenario.
- Achieved reactive strategies to complete navigation tasks considering the instability of legged robots.

PUBLICATIONS

(*Equally contributed) You can also find my articles on my Google scholar profile.
Manuscript Preprint:

[1] **Ziyi Zhou**, Stefano Di Cairano, Yebin Wang, Karl Berntorp. "Simultaneous Collision Detection and Force Estimation for Dynamic Quadrupedal Locomotion", *IEEE International Conference on Robotics and Automation (ICRA)(submitted), 2025*

[2] Fukang Liu, Zhaoyuan Gu, Yilin Cai, **Ziyi Zhou**, Shijie Zhao, Hyunyoung Jung, Sehoon Ha, Yue Chen, Danfei Xu, and Ye Zhao "Opt2Skill: Imitating Dynamically-feasible Whole-Body Trajectories for Versatile Humanoid Loco-Manipulation", *IEEE International Conference on Robotics and Automation (ICRA)(submitted), 2025*

Journals:

[3] Zhigen Zhao, Shuo Cheng, Yan Ding, **Ziyi Zhou**, Shiqi Zhang, Danfei Xu, and Ye Zhao. "A Survey of Optimization-based Task and Motion Planning: From Classical To Learning Approaches", *IEEE/ASME Transactions on Mechatronics, 2024*

[4] *Lasitha Wijayarathne, ***Ziyi Zhou**, Ye Zhao, and Frank L. Hammond III. "Real-Time Deformable-Contact-Aware Model Predictive Control for Force-Modulated Manipulation", *IEEE Transactions in Robotics (TRO), 2023*

[5] ***Ziyi Zhou**, *Bruce Wingo, Nathan Boyd, Seth Hutchinson, and Ye Zhao. "Momentum-Aware Trajectory Optimization and Control for Agile Quadrupedal Locomotion", *IEEE Robotics and Automation Letters (RA-L), 2022*

[6] *Zhigen Zhao, ***Ziyi Zhou**, Michael Park, Ye Zhao, "SyDeBO: Symbolic-Decision-Embedded Bilevel Optimization for Long-Horizon Manipulation in Dynamic Environments", *IEEE Access, 2021*

[7] Hongwu Zhu, Dong Wang, Nathan Boyd, **Ziyi Zhou**, Lecheng Ruan, Aidong Zhang, Ning Ding, Ye Zhao, and Jianwen Luo. "Terrain-perception-free Quadrupedal Spinning Locomotion on Versatile Terrains: Modeling, Analysis, and Experimental Validation", *Frontiers in Robotics and AI, 2021*

Conferences:

[8] Max Asselmeier, Jane Ivanova, **Ziyi Zhou**, Patricio A. Vela, and Ye Zhao. "Hierarchical Experience-informed Navigation for Multi-modal Quadrupedal Rebar Grid Traversal", *IEEE International Conference on Robotics and Automation (ICRA), 2024*

[9] Shiyu Feng, **Ziyi Zhou**, Justin S. Smith, Max Asselmeier, Ye Zhao, and Patricio A. Vela. "GPF-BG: A Hierarchical Vision-Based Planning Framework for Safe Quadrupedal Navigation", *IEEE International Conference on Robotics and Automation (ICRA), 2023*

[10] **Ziyi Zhou**, Dong Jae Lee, Yuki Yoshinaga, Dejun Guo, and Ye Zhao. "Reactive Task Allocation and Planning for Quadrupedal and Wheeled Robot Teaming", *IEEE International Conference on Automation Science and Engineering (CASE), 2022*

[11] **Ziyi Zhou**, and Ye Zhao. "Accelerated ADMM based Trajectory Optimization for Legged Locomotion with Coupled Rigid Body Dynamics", *American Control Conference (ACC), 2020*

[12] Lasitha Wijayarathne, Qie Sima, **Ziyi Zhou**, Ye Zhao and Frank Hammond III. "Simultaneous Trajectory Optimization and Force Control with Soft Contact Mechanics", *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020*

Abstracts and Workshops:

[13] **Ziyi Zhou**, Bruce Wingo, Nathan Boyd, Seth Hutchinson, and Ye Zhao. "Momentum-Aware Planning Synthesis for Dynamic Legged Locomotion", *Proceedings of Dynamic Walking, 2021*

ACADEMIC SERVICE

Reviewer, IEEE Transactions on Robotics (TRO)	2023, 2024
Reviewer, IEEE Robotics and Automation Letters (RA-L)	2019, 2022, 2023, 2024
Reviewer, Autonomous Robots	2023
Reviewer, IEEE International Conference on Robotics and Automation (ICRA)	2022, 2023, 2024
Reviewer, IEEE International Conference on Intelligent Robots and Systems (IROS)	2022, 2023, 2024
Reviewer, IEEE Conference on Decision and Control(CDC)	2022, 2023
Reviewer, IEEE-RAS International Conference on Humanoid Robots (Humanoids)	2022, 2023, 2024
Reviewer, IEEE Transactions on Control of Network Systems (TCNS)	2020

HONORS

Thank a Teacher Certificate (Georgia Tech)	2022
American Control Conference (ACC) Student Travel Award	2020
Liaoning Province Outstanding Graduate (top 3%)	2018
Meritorious Winner (top 10%), U.S Mathematical Contest in Modeling, COMAP	2016
Model Student of Academic Records (top 10%), NEU	2015, 2016, 2017, 2018

TECHNICAL SKILLS

Programming Languages	C/C++, Python, MATLAB, HTML
Robotics Softwares & Tools	ROS, Drake, OCS2, Pinocchio, Crocoddyl
Optimization Tools	IPOPT, SNOPT, Gurobi, OSQP, CasADi